

APHIDIDÆ OF SOUTHERN CALIFORNIA VIII

Plant Lice Affecting the Citrus Trees*

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There has been much speculation in the minds of many of the citrus growers and horticultural commissioners in Southern California regarding the plant lice which affect the citrus trees. In fact, the ignorance regarding these insects, as expressed by the secretary of the horticultural commissioner in a neighboring county, certainly justifies the publication of a study such as this is intended to be. At a recent meeting held in Los Angeles by the Los Angeles County Horticultural Society, for the purpose of discussing the topic, "Insect Pests and Methods for Their Control," it was emphatically argued by members of the Los Angeles Horticultural Commission that the Black Peach Aphis, *Aphis niger* Smith, was attacking certain orange groves in Southern California. When it was said that the Black Peach Aphis did not work on citrus trees there was such a confusion created in the minds of all present that I do not wonder if many of the citrus growers, especially in the districts where entire peach orchards are now being uprooted because of that insect, are not afraid that the citrus trees may go next. Though this is an extreme and remote possibility even under most ignorant direction, still it shows how little is actually known regarding these aphids, which are designated by the orchardists as small beetles, gnats, flies, etc., and it shows also how great the value of a thorough knowledge of them will be.

Practically every locality in which citrus trees are grown, has been visited, and extensive collections of plant lice made for the purpose of this study. Perhaps some of these insects have been passed unobserved, but all the common injurious forms are here presented, and comprise four genera and five species as follows: *Aphis cookii* n. sp., *Aphis gossypii* Glover, *Macrosiphum citrifolii* (Ashmead), Green Peach Aphis, *Myzus persicae* (Sulz.), and the Citrus Aphid, *Toxoptera aurantiae* Koch. All of these have been carefully drawn and described from fresh and living specimens so as to get accurate color notes and body shapes.

In connection with the following descriptions I have also worked up, as thoroughly as possible, all of the natural parasites and predaceous enemies which prey upon the plant lice and which are responsible for their not doing greater damage; in fact, these practically control all infestations on citrus trees, with the exception of sometimes a few localized cases during the early spring and summer months.

For the specific cases where the aphids are not controlled by natural enemies and where it is necessary to employ artificial means of control I have prepared spray formulæ, which are specially adapted for citrus trees, and which will usually bring immediate relief if applied as directed. It is sometimes very important to have these at hand, particularly in cases of heavy infection of very young trees, where considerable damage may be done in a very short time.

*This masterly study of the Citrus Plant Lice, indicates again most clearly and indubitably, the preeminent importance of having only men with some technical training, for the important work in the office of County Horticultural Commissioner. It is not possible for men without this training to work either intelligently, or with safety to the important interests which they are supposed to guard.—*Ed.*

It will be my aim to continually improve this first article by adding descriptions of new aphids, natural enemies and better means of artificial control. I invite the aid of all growers and other interested parties and ask them to send specimens which have not been included here, and I shall be glad to make any determinations of plant lice, provided they are shipped in large quantities with the host plant in a strong box so that the natural color and body shape can be studied in connection with the anatomical characters.*

Aphis cookii n sp.

WINGED VIVIPAROUS FEMALE (Figure 191 A).

1910 *Aphis gossypii* Glover-Essig, Pomona Jr. Ent. Vol. II., pp. 223-224.

Length of body not including style 1.75 mm., width of mesothorax 0.70 mm., greatest width of abdomen 0.78 mm., wing expansion 7.20 mm., rather large and robust form.

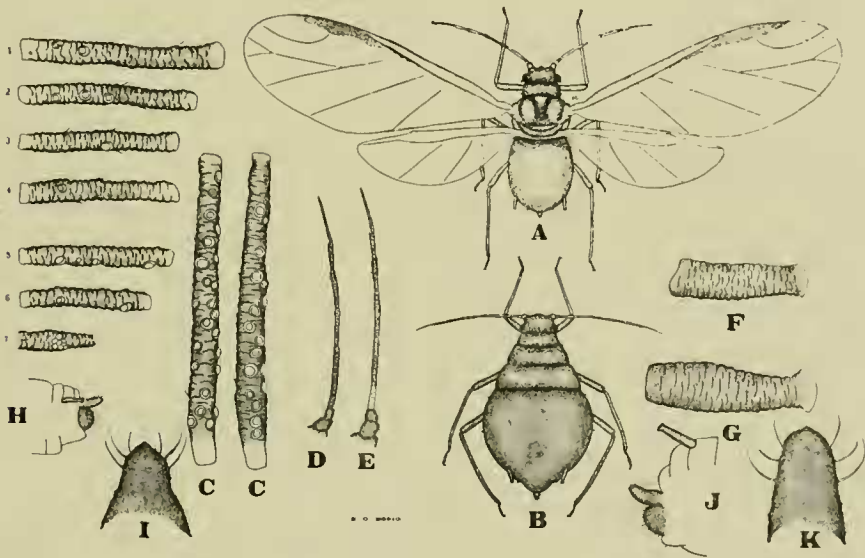


Figure 191. *Aphis cookii*

Prevailing Color—Dark gray or black with a whitish flocculenee which makes it appear whitish. *Head*—Black or dark brown, nearly twice as wide as long, with rather large antennal tubercles, but these are not at all prominent. *Eyes*—Very dark red or brown, terete tubercles extending nearly at right angles to the eye-surface. *Antennae* (Fig. 191, D)—On small frontal tubercles, not as long as the body, reaching to the bases of the cornicles, very sparsely haired, dark throughout, imbricated; lengths of articles: I, 0.08 mm.; II, 0.08 mm.; III, 0.35 mm.; IV, 0.22 mm.; V, 0.22 mm.; VI, 0.44 mm. (spur 0.3 mm.); total 1.39 mm. It will be seen from the above that I and II are coequal, III longer than either IV or V, but shorter than VI; IV and V coequal. The sensoria are distributed as follows: Article III (Fig. 191, C, C) with from seventeen to twenty-eight large

circular sensoria scattered over the surface; IV (Fig. 191, 1, 2, 3, 4) with from one to three large circular sensoria, which may be scattered at the base or near the apex of the article, but they are usually on the basal half; V with from two to three large circular sensoria (Fig. 191, 5, 6) and in some instances one small one as shown in drawing. There is usually but one sensorium. The small group in the nail-like process of article VI is shown in Fig. 191, 7. *Rostrum*—Reaching to second coxæ, with dark base and tip. *Prothorax*—More than twice as wide as long; dark, with very small lateral tubercles. *Meso- and Metathorax*—Wide, black, with prominent muscle lobes. *Abdomen*—Well rounded, dull green or brownish-green, bearing a transverse row of quite long white flocculence on each segment (not shown in the cut), which may nearly cover the entire body. Anal plate (Fig. 191, H) dark, hairy, three small marginal tubercles on each side. *Cornicles*—(Fig. 191, F). Short, somewhat cylindrical, with wide mouth, base little wider than apex, narrowest just before the mouth, imbricated, black, longer than the style, length 0.16 mm. *Legs*—Moderately long and hairy, black or dark brown throughout. *Wings*—Large, hyaline. *Primary*—Length 3.3 mm., width 1.25 mm. Costal vein stout, dark brown; subcostal wide, brown; stigma long and narrow, widest at the base of the stigmal vein, from whence it narrows to a point at the wing margin, the opposite sides are nearly parallel, length 0.95 mm., width 0.16 mm., amber brown; stigmal vein arising three-fifths the distance from the base of the stigma, strongly curved throughout first half and slightly curved throughout the apical half, rather long, brown or amber; first and second discoidals straight; third discoidal twice branched, first branch arising one-third the distance from the base to the tip, short, parallel with the apical one-third of the stigmal vein, brown arising very near to the tip of the first branch (three-fourths the distance from the base to the tip), short, parallel with the apical one-third of the stigmal vein, brown or amber. *Secondary*—Length 1.8 mm., width 0.65 mm.; subcostal vein curved downwardly just beyond the base of the second discoidal and then curves downwardly to original level to tip of the wing; first discoidal arising just beyond one-fourth the distance from the base to the tip of the subcostal, slightly curved outwardly, does not touch the subcostal vein or the wing margin; second discoidal arising from the middle of the subcostal and nearly straight, does not touch subcostal vein, but extends to wing margin; all veins brown. *Style*—(Fig. H and I). Bluntly ensiform, or conical, beset with stiff hairs, rough, dark, curving upward, length 0.12 mm.

APTEROUS VIVIPAROUS FEMALE (Figure 191 B)

Length of body not including style 2.2 mm., width of abdomen 1.3 mm.

A larger and more robust form than the winged female.

Prevailing color—Very dark green or brown, covered with transverse rows of rather long white flocculence on the body, giving it a grayish appearance. Body gradually widening from head to the middle of the abdomen and then rounds off to the style, robust. *Head*—With slight frontal tubercles, much wider than long, dull green or brown. *Eyes*—Red. *Antennae* (Fig., E)—On very slight

frontal tubercles, much shorter than the body, very sparsely haired, dark throughout except the base of article III, imbricated. The lengths of the articles are as follows: I, 0.1 mm.; II, 0.07 mm.; III, 0.4 mm.; IV, 0.21 mm.; V, 0.21 mm.; VI, 0.4 mm. (spur 0.26 mm.); total 1.39 mm. With sensoria on V and VI articles as in normal forms. *Rostrum*—Reaching just beyond second coxæ, amber brown with darker base and tip. *Prothorax*—Slightly wider than head, with small lateral tubercles. *Abdomen*—Well rounded, dull green, covered with flocculence, three small marginal tubercles on the sides. *Cornicles* (Fig., G)—Inerassate, nearly vasiform, imbricated, widest in middle and narrowest just before the mouth, often appear cylindrical with swollen tip, black, length 0.2 mm. *Style* (Fig., J and K)—Conical or bluntly ensiform, rough, hairy, black, length 0.14 mm., shorter than the cornicles.

Young—Much lighter in color than the adults and almost destitute of the white flocculence.

Host—Orange trees, where it occurred in great numbers.

Locality—Collected by Horticultural Inspector C. H. Vary at Pomona, Calif. It has never been located anywhere else and cannot even be found there just now.

Date of Collection—April 4, 1909. Serial number 36.

The general appearance of this insect with its short antennæ and cottony covering is not unlike that of one of the members of the genus *Lachnus* and was so recorded by me at the time it was first obtained. Strange to say, when first collected by Mr. Vary it occurred in such numbers as to nearly ruin the infested trees. Prompt measures were taken to hold the pest in check and it soon disappeared. Since then I have been unable to obtain fresh material. From the very beginning it did not appear to be *Aphis gossypii* Glover, but I thought it might be one of the various forms of that species and so described it as such. Since that I time have sent specimens to various of the authorities on this group and have received the following replies:

"Your letter of the 13th ult. at hand and I have gone over the slides you sent. I am returning them under separate cover and will say that those labeled *Aphis gossypii* are not that species. . . ."—H. F. Wilson, Oreg. Agr. Exp. Sta., Mar. 2, 1911.

"I feel certain that the insect that you have figured as *Aphis gossypii* is quite wide from that species. This insect is a very abundant one in Colorado upon our eueurbitaceous plants, especially infesting the cantaloupe. I have also material from the cotton plant in Texas and am quite certain that we have the species correctly determined. . . ."—C. P. Gillette, Colo. Agr. Exp. Sta., June 9, 1910.

"*Aphis* sp.? No. 36.—It appears to be nearest related to *A. gossypii*, though there are too many sensoria in the third antennal joint."—Theo. Pergande, Bur. Ent., U. S. Dept. Agr., June 12, 1911.

Not being able to place this as an already described species, I have felt justified in calling it a new species, and have named it in honor of Prof. A. J. Cook of Pomona College, whose work for the upbuilding of the citrus industry in this State is well known throughout the entire country.

Aphis gossypii Glover

1854 *Aphis gossypii* Glover, Pat. Off. Rept., p. 62.

1882 *Aphis citrulli* Ashmead, "Florida Dispatch," vol. 1, p. 241.

1883 *Aphis cucumeris* Forbes, 12th Rept. Ent. Ill., pp. 83-91.

WINGED VIVIPAROUS FEMALE (Figure 192 A)

Length of body not including style 1.35 mm., width of mesothorax 0.42 mm., greatest length of abdomen 0.65 mm., wing expansion 5.10 mm. Very small form.

Prevailing color—Dark, black or very dark green or brown. *Head*—Much wider than long, black. *Eyes*—Very dark red or brown. *Antennae* (Fig. 192, c and b)—Arising directly from the head, not as long as the body, reaching to the bases of the cornicles, sparsely haired; articles I and II dusky, III with light base and remainder dusky, IV and V light yellow with apical halves dusky, VI dusky throughout; length of the articles: I, 0.07 mm.; II, 0.04 mm.; III, 0.22 mm.; IV, 0.17 mm.; V, 0.17 mm.; VI, 0.37 mm.; (spur 0.26 mm.); total 1.04 mm.; from seven to eight large circular sensoria on article III (Fig. 192, h), remaining article normal. *Rostrum*—Reaching to or slightly beyond third coxæ, lemon yellow with the base and tip dusky. *Prothorax*—Slightly wider than the head, but no longer; black, with distinct lateral tubercles. *Meso- and Metathorax*—Black, with prominent muscle lobes. *Abdomen*—Smooth, dark green or greenish brown, with an irregular lighter area on the dorsum, ventral surface dull green, small lateral marginal tubercles extending from sides, anal plate (Fig. 192, a and b) dusky, hairy. *Cornicles* (Fig. 192, g)—Cylindrical, wider at base and gradually tapering to tip; imbricated, black, curved slightly outwardly in some specimens, length 0.2 mm. *Legs*—Normal, hairy, coxæ black, femora of first and second pairs light yellow, femora of third pair yellow with apical three-fourths dusky, tibiae yellow with dark tips, tarsi dark. *Wings*—Rather large for the size of the species, hyaline. *Primary*—Length 2.3 mm., width 0.95 mm.; costal vein dark and well defined; subcostal wide, yellow; stigma long and narrow, tapering from the base of the stigmal vein to a point at the tip, amber in color, length 0.65 mm.; first discoidal straight, second discoidal curved inwardly toward the body, third discoidal twice-branched and curved slightly inwardly, first branch arising near the middle of the vein, the second branch arising nearer the tip than the middle of the first branch—both of these branches curve toward the third vein. All veins are amber. *Primary*—Length 1.5 mm., width 0.55 mm.; subcostal curved downwardly at the base of the second discoidal and then curves upwardly to point of wing; discoidals nearly straight. *Style* (Fig. 192, a, dorsal, and b, ventral)—Conical or nearly cylindrical, hairy, green, with dusky tip, length 0.11 mm.—a little more than half as long as the cornicles.

APTEROUS VIVIPAROUS FEMALE (Figure 192 B)

Length of body not including style 1.8 mm., width of abdomen 0.9 mm. Larger than the winged form and more robust, although many are oblong in shape, not as robust as the apterous forms of *Toxoptera aurantiae* Koch. Some slightly pruinose giving them a gray color.

Prevailing color—Black or dark olive green. *Head*—Well rounded in the front, nearly as long as wide, black. *Eyes*—Dark red or brown. *Antennae* (Fig. 192, f)—Not arising from frontal tubercles, but direct from the head, much shorter than the body—not reaching to the bases of the cornicles; articles I and II dark, III and IV light lemon yellow, V light lemon yellow with a dark tip, VI

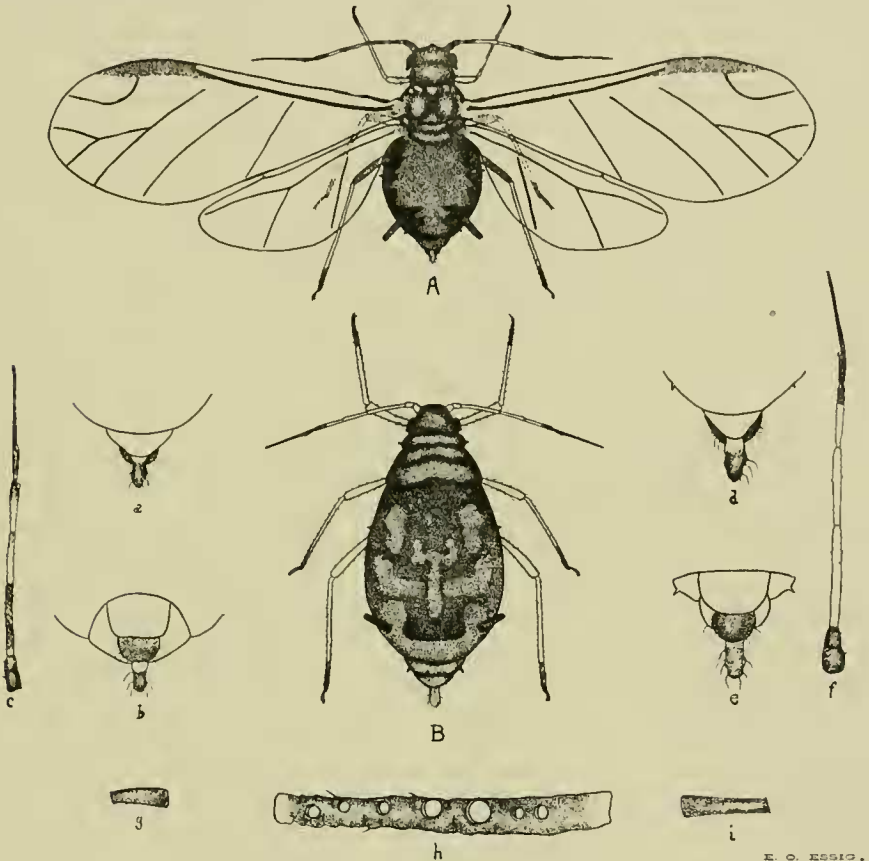


Figure 192. *Aphis gossypii*

dusky throughout; lengths of the articles: I, 0.08 mm., II, 0.06 mm.; III, 0.32 mm.; IV, 0.25 mm.; V, 0.21 mm.; VI, 0.35 mm. (spur 0.25 mm.); total 1.27 mm.; all articles sparsely haired; sensoria on articles V and VI normal. *Rostrum*—Reaching just beyond the third coxæ, lemon yellow with dark base and tip. *Prothorax*—Very short, with distinct lateral tubercle. *Meso- and metathorax*—Narrow transversely. *Abdomen*—Smooth, dark green with irregular lighter markings on the dorsum and with small marginal tubercles on the sides, ventral surface dull green. Anal plate (Fig., d, dorsal, and e, ventral)—Dusky, hairy. *Cornicles* (Fig. 192, i)—Cylindrical, widest at base and gradually tapering to tip, imbricated, black, length 0.27 mm. *Legs*—Normal, coxæ dark, femora light yellow, tibiæ

light yellow with dark tips, tarsi dark. *Style* (Fig. 192, d and e)—Conical or nearly cylindrical, hairy, dusky green to dark brown, length 0.13 mm.

Young—Dark green or brownish. Some are slightly pruinose.

Hosts—This insect has been taken in this locality only upon the tender growth of orange trees. Near Pomona it was found by the writer several years ago in great numbers feeding upon the tender shoots of young Valencia trees. At Santa Paula it has been found only upon the suckers of the Havana Seedling Sweet Orange.

This insect is indeed a very extensive feeder and has been taken from over fifty different plants throughout the United States. It was originally found upon the cotton plant and has since proven a great melon pest. It is known by the common names "Cotton Aphis" and "Melon Aphis." In this particular locality there are numerous melon vines growing near orange groves which have been infested with this louse, but I have never yet found a single vine infested with this louse. I recently received a shipment of eight distinct species of plant lice from Imperial County, where the melons suffer from their depredations, but none of them proved to be this species, although this does not prove that it does not exist in that locality. It was not the most abundant this year if I may judge from this sending.

Locality—On citrus trees throughout this State and also reported on various other plants. Taken in Orange, Los Angeles, San Bernardino and Ventura Counties by the writer.

Date of Collection—This species, like *Toxoptera aurantiae* Koch, is most abundant during the early spring months from February to June. Collected in large numbers at Santa Paula, May 17, 1911. Serial number 6.

Natural Enemies—Subject to the attacks of the same natural enemies as are described under *Toxoptera aurantiae* Koch.

In the Pomona College Journal of Entomology, Vol. 1, pp. 47-48, 1909, I described this insect as *Aphis citri* Ashmead. In the same Journal, Vol. II, pp. 223-224, 1910, the species described as *Aphis gossypii* Glover has proven to be a new and distinct species and is herein described as *Aphis cookii* n. sp. resembling the Pea and Rose Aphids.

Macrosiphum citrifolii (Ashmead)

1882 *Siphonophora citrifolii* Ashmead, Can. Ent. Vol. XIV, p. 92.

WINGED VIVIPAROUS FEMALE (Figure 193 A)

Length not including style 2.2 mm., width of mesothorax 0.7 mm., greatest width of abdomen 0.9 mm., wing expansion 9.0 mm. A large green louse greatly

Prevailing color—Bright pea green, shiny. *Head*—Slightly wider than long, amber to pinkish yellow in color, with rather large antennal tubercles. *Eyes*—Red. *Antennae*—(Figure 194 a). On rather large tubercles, longer than the body, with very few hairs, articles I and II dusky green, III dusky amber with extreme base light, IV, V and VI dusky throughout; the lengths of the articles are as follows (although these vary greatly): I, 0.14 mm.; II, 0.08 mm.; III, 0.74 mm.; IV, 0.7

mm.; V, 0.67 mm.; VI, 1.0 mm. (spur 0.76 mm.); total 3.33 mm. There are from fourteen to fifteen large circular sensoria in a row on article III and usual number on V and VI. *Rostrum*—Reaches nearly to the second coxæ, dark at tip only; remainder, color of body. *Prothorax*—Much wider than long, light green in color, without lateral tubercles. *Meso- and Metathorax*—Dorsum light green with the muscle lobes pinkish or amber, ventral side darker on middle. *Abdomen*—Long and regularly rounded, light shiny green with a darker green longitudinal band

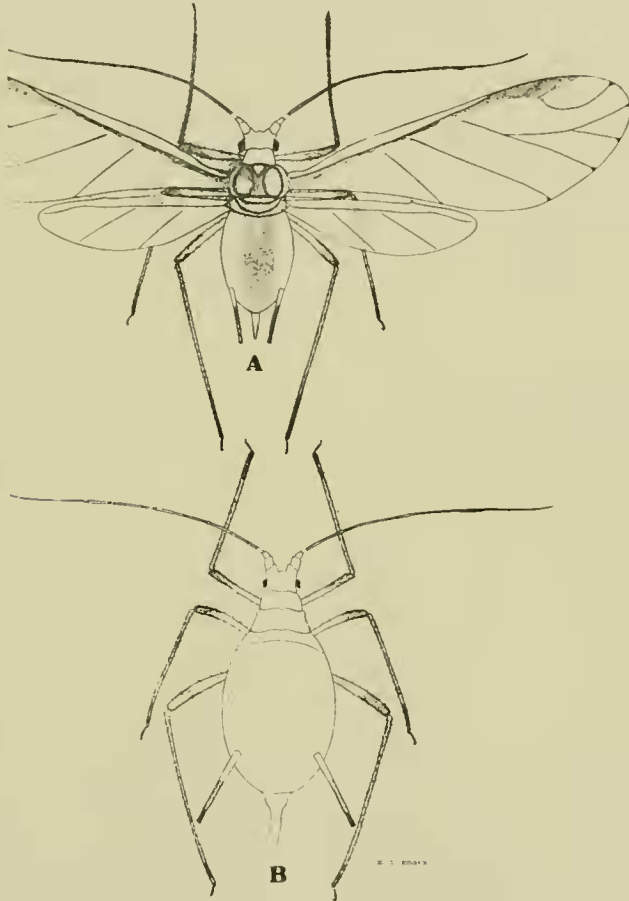


Figure 193. *Macrosiphum citrifolii*

on the middle of the dorsum, all green ventrally, may, or may not, have red spots on dorsum. *Cornicles*—(Figure 194 g). Cylindrical, long, restricted before apex, with mosaic markings in the restricted area, nearly twice as long as style, color of body with the apical two-thirds dusky, length 0.7 mm. *Legs*—Long and slender, normally haired, coxæ color of body, femora green with apical half dusky, tibiae dusky throughout, tarsi dark. *Wings*—Hyaline. *Primary*—Length 4.2 mm., width 1.45 mm.; veins ending in dusky spot at wing margin; costal well defined, but narrow, light yellowish green; subcostal wide, light yellowish green;

stigma long and narrow, light yellowish green, stigmal vein well curved and arising from the stigma at its widest point (just beyond the middle from the body); first and second discoidals nearly straight; third discoidal nearly straight, first branch slightly curving downward, second branch arising near the middle of the branch. All veins except those already specified are amber in color. *Secondary*—Length 2.4 mm., width 0.65 mm.; subcostal curved upward near the tip, first and second discoidals straight and arising one-third and two-thirds respectively, the distance from base to tip of subcostal; amber. *Style*—(Figure 194 m). Ensiform, hairy, color of body or slightly dusky, length 0.32 mm.

APTEROUS VIVIPAROUS FEMALE (Figure 193 B)

Length of body not including the style 2.6 mm., greatest width of abdomen 1.35 mm. Larger and more robust than the winged form.

Prevailing color—Bright, shiny green. *Head*—Yellow. *Eyes*—Red. *Antennae*—(Figure 194 b). On rather prominent frontal tubercles (more prominent than those of the winged form), longer than the body, slightly hairy, articles I and II color of the head, III dusky with light base, remaining articles dusky throughout, the lengths of the articles are as follows: I, 0.12 mm.; II, 0.08 mm.; III, 0.79 mm.; IV, 0.65 mm.; V, 0.59 mm.; VI, 1.2 mm. (spur 0.86 mm.); total 3.25 mm.; there are three or four circular sensoria on article III (Figure 194 b). *Rostrum*—Reaching just beyond second coxæ, dark at tip only. *Thorax*—Widening from the prothorax to the abdomen, yellowish green. *Abdomen*—Smooth, shiny green, with or without red dorsal spots. *Cornicles*—Same shape as those of the winged form, basal one-third or half green with remainder dusky, length 0.97 mm. *Style*—(Figure 194 n). Ensiform, hairy, green with margins slightly dusky, length 0.6 mm.

Young—Young are green and greatly resemble the adults in all characters.

Host—Found abundantly feeding on young seedling orange trees and upon the tender shoots and suckers of old seedling orange trees. Not taken on Valencia trees or on lemon trees, although it is not improbable that this insect does feed upon them as well as upon the seedling trees. The young shoots and buds may become so badly infested as to be entirely killed in a few weeks and care must be taken to keep this insect in check. Due to its green color it is seldom noticed until the twigs are beginning to show an unhealthy color.

Locality—Santa Paula, Cal. This insect has also been collected from nearly every citrus-growing section in Southern California. Wm. Davidson reports this species from Lindsay, Tulare County, Cal. (Jr. Ec. Ent. III, p. 380, 1910).

Date of Collection—April 7, 1911. Serial number 25.

In 1880 Wm. Ashmead described several forms under the heading of this insect, some of which were certainly not of this species, but were of the species *Aphis gossypii* Glover. His description is as follows:

"From observations made this year I find that from an egg laid by a fall oviparous female, which I described as follows:

"*Young*—Length .02 inch. Dark greenish brown, with dark eyes and glassy white antennæ and legs.

“*Male*—Length .04 inch. Color brown and brown-black; antennæ brown, legs pale or yellowish, posterior femora slightly shaded above with brown or black; feet reddish; nectaries shorter than in female; wings hyaline, stigmal spot pale. These are rare among the first broods, and afterwards almost or entirely disappear.

“*Female*—Apterous, length 0.05 to 0.06 inch. Broadly ovate. Dark brownish-black. Head between antennæ reddish; antennæ seven-jointed, pale yellowish, apical ends of joints, three, four and five brown, six shortest, seven long, setaceous; legs pale yellow, latter two-thirds of the femora brownish or blackish, tips of tibiæ and claws brown; nectaries slightly thickest at base, black and cylindrical, cauda distinct.

“*Winged Viviparous Female*—Length 1.06 inch. Color black and shining; eyes red-brown, tubercles of antennæ black, vertex of head reddish; rostrum reaching back of middle coxæ; antennæ not quite reaching to tip of abdomen; abdomen variable, brown-black, brown or olive-green; wings hyaline; stigma rather broad, brown, obliquely sharpened to a point at outer edge towards apex; stigmal vein strongly curved, dark; three oblique veins, the third forked; hind wings with two oblique veins in all specimens but one, nectaries long, cylindrical and black; cauda long and recurved, dark.

“I have watched these viviparous females breed on my orange trees and the rapidity with which this is done is simply astonishing. In a few days broods upon broods, or young colonies, seem to exist on all the tender new leaves and shoots, and still the parthenogenetic young keep coming. Verily, if it were not for the chalcid flies, ichneumonids and other parasites, they would be the death of the trees. By the middle of March a change takes place in the broods. The young differ from their parents in shape, color and size. So different are they as to discredit belief, and had I not watched them breeding day by day on my orange trees, I should have felt justified in describing them as a distinct species. They are undoubtedly a dimorphic form, and I give below a description:

“*Dimorphic, Viviparous, Apterous Female*—Length, 0.08 to 0.09 inch. Elongate; color of a uniform pale pea-green with more or less of a longitudinal shading of darker green on the dorsum, with the surface more or less corrugated; eyes bright red, with a prominent facet or ocellus springing out from hinder edge of same, giving it a tooth-like appearance; antennæ VII jointed, pale glassy green, in mature specimens the tip from the fifth joint is reddish; legs of the same uniform pale green; cauda small, conical. Beak does not quite reach to tip of middle coxæ.

“The winged form agrees in every respect with the above description, and can only be distinguished by having wings, the veins of which are very pale. These are rare, the majority being wingless.

“The mature viviparous female continues breeding and can often be found surrounded by from twenty to thirty pale green young; occasionally a brown one will be found among them. These continue breeding for several generations, ultimately giving place to the original type, and by the last of April none can be found. Why this change of form occurs is yet a mystery, and needs further investigation. Towards the end all seem to be parasitized by a *Trioxys*, *T. testaceipes* Cresson,

which thoroughly eradicates them." Wm. H. Ashmead, Can. Ent. XIV, p. 88, 1882.

For no little time *Siphonophora citrifolii* Ashm. was considered a distinct species, but with the study of *Aphis gossypii* Glover it was learned that many of the above dimorphic forms were of this latter species and that after all Ashmead had not described a new species at all, but had redescribed *Aphis gossypii* Glover. This is what Theodore Pergande writes concerning *Aphis gossypii* Glover:

"In 1880 Mr. Wm. Ashmead redescribed this species in his pamphlet on 'Orange Insects,' under the name of *Siphonophora citrifolii*, which he found to be infesting his orange trees, without being aware that the same insect infests also cotton and had been described previously.

"Again in 1882, Mr. Ashmead, in a paper on the 'Aphididæ of Florida' in the Canadian Entomologist (Vol. XIV, p. 91), in discussing dimorphism among insects, besides reproducing his original description, makes the serious mistake of describing on page 92 another species as a dimorphic form of his *citrifolii*, which, however, according to the characters given in this description, is neither a true *Aphis* nor a *Siphonophora*, but appears to belong to the genus *Rhopalosiphum*. Mixed colonies of closely related and other species of aphides are frequently found infesting the same plant at the same time, which, however, does not indicate dimorphism." Insect Life, Vol. 7, pp. 310-311, 1895.

No doubt Mr. Pergande was referring to the description of the dimorphic, viviparous, apterous females as described by Mr. Ashmead and this is without doubt the *Siphonophora citrifolii* of Ashmead. Although this may not be the insect which he originally described under that name, he, nevertheless, describes it as a dimorphic form and his description of this is adequate to decide that the *Macrosiphum* found on citrus trees in this state is the same as the *Siphonophora citrifolii* described by Ashmead. In spite of the fact that this species has been regarded, by many, as a synonym of *Aphis gossypii* Glover, this so-called dimorphic form is a good and distinct species and I trust that this description and the accompanying drawings shall serve to give it a proper place in the literature of the family Aphididæ.

The species resembles in a number of ways the Rose Aphid (*Macrosiphum rosae* Linn.) and the Pea Aphid (*Macrosiphum destructor* John.) and might easily be taken for either. Figure 194 shows a comparison of the antennæ, cornicles and styles of these three species. It will be seen that the number of sensoria on the third antennal article of the winged female vary greatly, there being more than twice as many on *M. rosae* than on either of the other two; more on *M. destructor* than on *M. citrifolii*. The third antennal article of *M. citrifolii* and *M. destructor* have three or four sensoria each, while there are thirteen or fourteen on the third article of *M. rosae*. The third article of *M. rosae* is longer than that of *M. citrifolii*, while that of *M. destructor* is longer than either. The cornicles of *M. rosae* and *M. citrifolii* have a restriction at the tip with a mosaic figure in the restricted area, while the cornicles of *M. destructor* are not restricted near the tip. Those of *M. rosae* are dusky throughout, those of *M. citrifolii* are dusky on the apical half or two-

thirds, while those of *M. destructor* are dusky only at the tips. The styles of *M. citrifolii* are the smallest, of *M. rosae* next in size (both of these are quite hairy) while those of *M. destructor* are much larger and are nearly destitute of hairs. The general appearance of *M. rosae* is also easily told by the rosy forms and by the dark legs, the black markings of the head, thorax, and abdomen. Neither of the

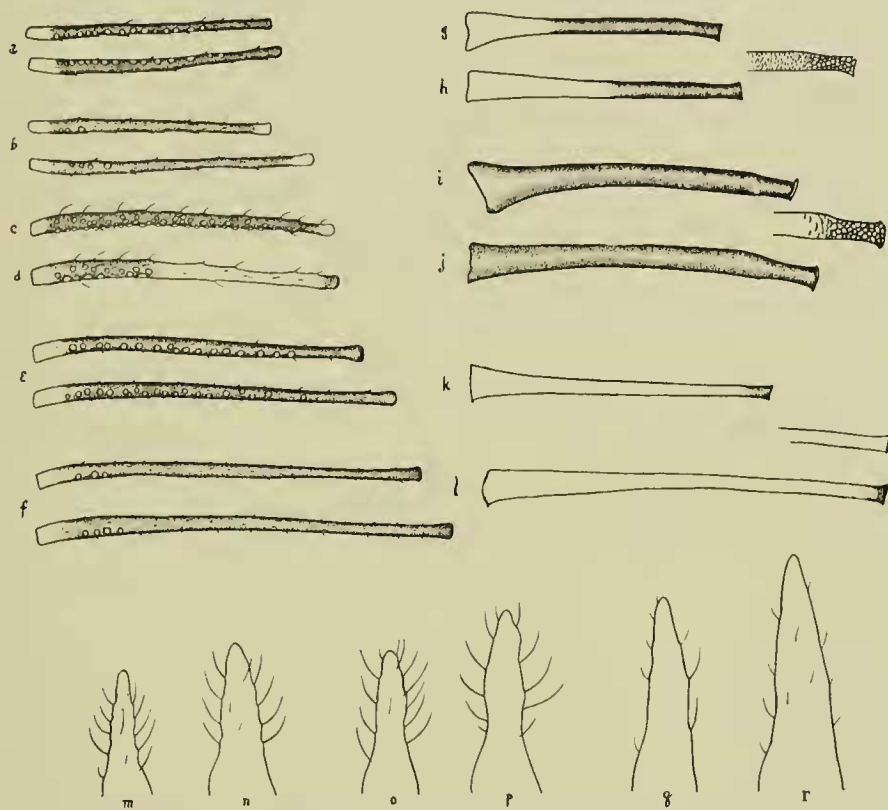


Figure 194. Details of *Macrosiphum citrifolii* (a, b, g, h, m, n); *Macrosiphum rosae* (c, d, i, j, o, p); *Macrosiphum destructor* (e, f, k, l, q, r)

latter forms have these characters, except the darkened areas on the legs and these are much fainter.

Natural enemies—*Macrosiphum citrifolii* Ashm. is very effectually held in check in California by the predaceous ladybird beetles, *Coccinella californica* Mann, *Hippodamia convergens* Guer. and *Coccinella abdominalis* Say and by the larvæ of the Syrphid Flies *Syrphus americanus* Wied., *Allograpta obliqua* Say., and *Lasiophthicus pyrastris* L.

I am indebted to Mr. John June Davis for his aid in the determination of this species.

Myzus persicae (Sulzer) Passerini
GREEN PEACH APHIS

- 1761 *Aphis persicae* Sulzer, *Kenz. Insect P.* 105.
 1843 *Aphis dianthi* Schrank, *Fauna Boica*, II.
 1843 *Aphis persicae* Kalt., *Mon. Pflz.*, pp. 93-94.
 1847 *Aphis persicophila* Rondani, *Ann. Sci. Nat. Bolog.* 337-432.
 1857 *Rhopalosiphum dianthi* Schrank, *Koch, Die Pflz.*, p. 42.
 1857 *Aphis institutiae* Koch, *Die Pflz.*, pp. 58-59.
 1860 *Myzus persicae* Pass., *Gali Afidi*.
 1867 *Aphis persicaecola* Boisduval, *Mon. Aley*.
 1876 *Myzus persicae* Sulz-Buckton, *Mo. Brt. Aphid.* I, 178.
 1879 *Myzus achyranthes* Monell, *Bull. U. S. Geol. Survey*, V. I, p. 18.
 1880 *Rhopalosiphum dianthi* Schr., *Thos. 8th Rept. Ent. Ill.*, p. 80.
 1880 *Myzus persicae* Sulz., *Thomas, 8th Rept. Ent. Ill.*, p. 76.
 1886 *Myzus malvae* Oestlund, *Iist. Aphid. Minn.*, p. 31.
 1908 *Myzus persicae* Sulz., *Taylor, Jr. Ec. Ent.*, I, 83.
 1908 *Myzus persicae* Sulz-Gill. and Taylor, *Bull.* 133-134 *Colo. Exp. Sta.*
 1908 *Myzus persicae* Sulz-Gillette, *Jr. Ec. Ent.* I, 359
 1909 *Myzus persicae* (Sulz), *Fullaway, Ann. Rept. Hawaii Agrcl. Exp. Sta.*, 28-29.
 1910 *Myzus achyranthes* (Monell), *Williams, Aphid. Nebr.*, p. 63.
 1910 *Rhopalosiphum dianthi* (Schrank), *Williams, Aphid. Nebr.*, p. 69.

SPRING MIGRANT

WINGED VIVIPAROUS FEMALE (Figure 195 A)

Length of body 1.9 mm., width of mesothorax 0.5 mm., greatest width of abdomen 0.82 mm., wing expansion 6.8 mm.

Prevailing color—Green with dark dorsal markings. *Head*—Dark with lighter line at base, nearly as long as broad, with prominent, approximate, frontal tubercles. *Antennae*—(Figure 195 G). Gibbous on the inner basal sides, longer than body, dark except base of article III, sparsely hairy, lengths of articles: I, 0.1 mm.; II, 0.08 mm.; III, 0.58 mm.; IV, 0.43 mm.; V, 0.30 mm.; VI, 0.7 mm. (spur 5.2 mm.); total 2.19 mm.; at least twelve sensoria on article III. *Rostrum*—Reaching to or nearly to second coxæ, light with apical half dark. *Prothorax*—Black or dark with light band at central base and lateral basal corners light. *Meso- and Metathorax*—Shiny black. *Abdomen*—Green, brownish, or amber with darker dorsal markings as shown in drawing, ventral surface dusky. *Cornicles*—(Figure 184 E.) Cylindrical or slightly clavate, reaching beyond tip of abdomen, dark, length 0.42 mm., width at base .05 mm., greatest width 0.065 mm.; in some cases there is a light spot on the apical half which does not quite reach to the apex. *Legs*—Normal, coxæ light green; femora of prothoracic legs with apical half dusky, of the second and third pairs the apical two-thirds dusky; tibiæ with dark tips; tarsi dark. *Wings*—Normal, hyaline. *Primary*—Subcostal vein wide, dusky; stigma long and narrow, dusky; veins amber brown (see drawing), length

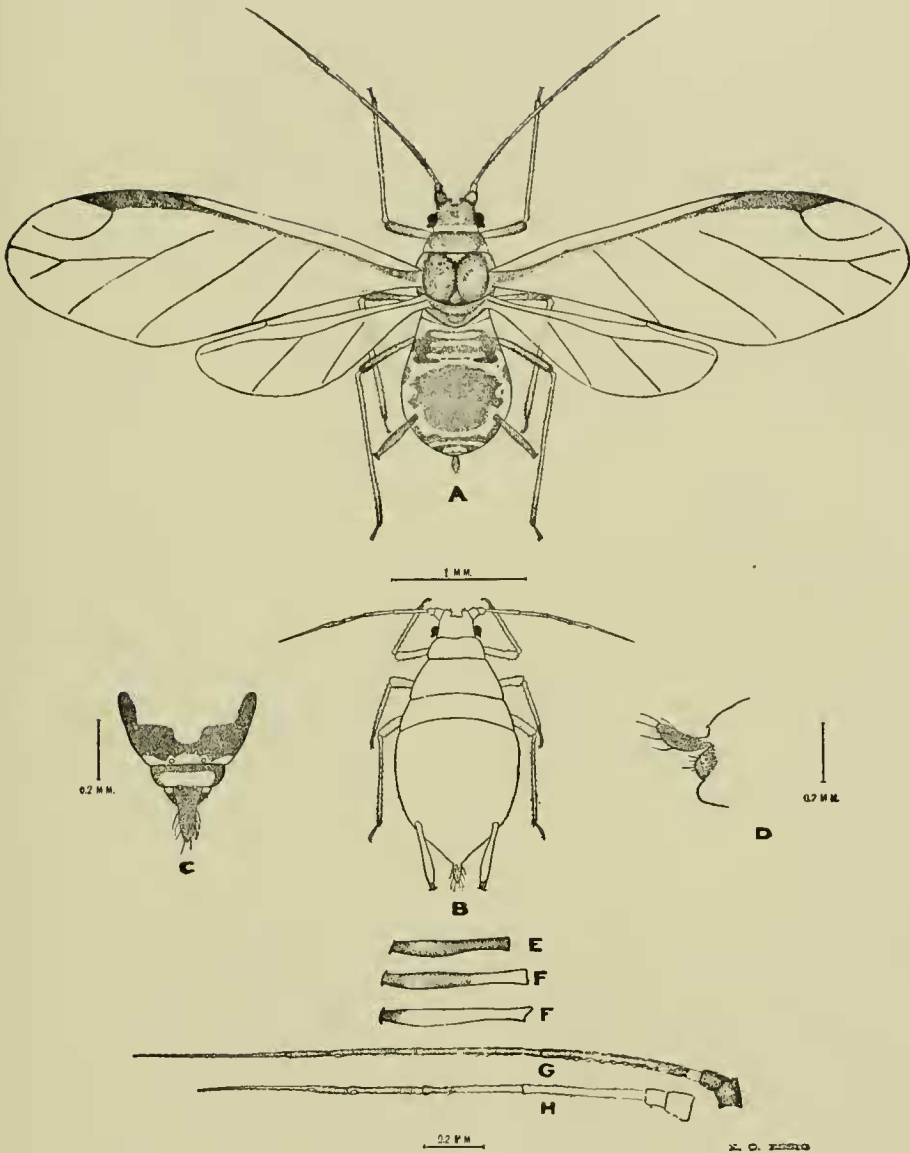


Figure 195. *Myzus persicae*

A, winged viviparous female; B, apterous viviparous female; C, pygidium of winged female, dorsal aspect; D, pygidium of apterous female, ventral aspect; E, cornicle of winged female; F, cornicle of apterous female; G, antenna of winged female; H, antenna of apterous female.

3.2 mm., width 1.2 mm. *Posterior*—Normal, length 1.8 mm., width 0.53 mm. *Style*—(Figure 195 C). Ensiform or nearly conical, sickle-shaped, dusky, length 0.2 mm.

APTEROUS VIVIPAROUS FEMALE (Figure 195 B)

Length of body 1.8 mm., greatest width of abdomen 0.95 mm.

Prevailing color—Bright yellowish green, shiny throughout. *Head*—Nearly as long as wide, with very prominent approximate and somewhat gibbous, frontal, antennal tubercles. *Eyes*—Red. *Antennae*—(Figure 115). On prominent tubercles, first article somewhat gibbous, reaching to base of the cornicles, articles I, II, III and basal two-thirds of IV light yellow, remainder dusky, lengths of articles: I, 0.09 mm.; II, 0.08 mm.; III, 0.43 mm.; IV, 0.34 mm.; V, 0.21 mm.; VI, 0.53 mm. (spur 0.38 mm.). *Rostrum*—Reaching to second coxæ, light with dusky tip. *Abdomen*—Smooth, light green, anal plate dusky. *Cornicles*—Figure 195 F1 and F2). Slightly clavate, light green with apical two-thirds or but one-fifth dark, reaching beyond tip of style, length 0.5 mm. *Legs*—Light green throughout with dark tarsi. *Style*—(Figure 195 D). Conical, sickle-shaped, length 0.2 mm., light green.

This species is one of the most widely distributed and most variable of the entire family. It presents a number of distinct forms, each of which has been described as a separate and distinct species, causing much confusion in the literature of the family *Aphididae*. Perhaps no one has worked it out more thoroughly than has Prof. C. P. Gillette of the Colorado Agricultural Experiment Station. In the *Journal of Economic Entomology*, Vol. I, p. 359-362, may be found his full descriptions. He separately describes the following forms: Young Stem-Mother, Adult Stem-Mother, Apterous Viviparous Female, Spring Migrant, Winged Viviparous Female, Fall Migrant, Oviparous Female, and Male. Of these I have described the Spring Migrant and the Apterous Viviparous Female, the forms most common in this locality. For the full descriptions see his article.

Hosts—I have obtained this species on citrus trees (Orange and Lemon), Potatoes, *Malva parviflora* L., and Tomatoes. It has also been reported as feeding upon the following plants: *Amsinckia spectabilis* F. & M., *Brassica oleracea* (Cabbage, Cauliflower), Celestial pepper (*Capsicum annum* var *abbreviatum* Fing.), *Chrysanthemum indicum* L., *Cynoglossum* sp., Carnation (*Dianthus caryophyllum* L.), English Ivy (*Hedera helix* L.), Plum (*Prunus domestica* L.), Peach (*P. persica* B. & H.), Groundsel (*Senecio vulgaris* L.), *Sonchus asper* Vill., *Sonchus oleraceus* L., Nettle (*Urtica urens* L.), *Prunus amygdalus amygdalus*, Cherry (*P. cerasus* L.), German Ivy, *Prunus insititia*, *Malva rotundifolia*.

Locality—Taken by the writer in many parts of Southern California, at Claremont, Santa Ana, Santa Paula and Pomona. Date of collection—April 14, 1911. Serial number 22.

Note—I am indebted to Mr. J. T. Monell for the specific determination of this species.

Toxoptera aurantiae Koch.

CITRUS APHID

- 1857 *Toxoptera aurantiae* Koch, Pflanzenlause pp. 254-255.
 1880 *Toxoptera aurantiae* Koch-Buckton, Mon. Brit. Aphid. p. 135.
 1910 *Toxoptera aurantiae* Koch-Fullaway, Rept. Hawaii. Agrel. Exp. Sta. pp. 341-342, for 1909.

WINGED VIVIPAROUS FEMALE (Figure 196 A)

Length of body not including style 1.6 mm., width of the mesothorax 0.55 mm., greatest width of abdomen 0.75 mm., wing expansion 6.5 mm. A small black form very common on Citrus in this State.

Prevailing color—Black, shining. *Head*—Narrow, but wider than long, black, with inconspicuous frontal tubercles. *Eyes*—Very dark red, almost brown. *Antennae*—(Figure 196 D). On inconspicuous frontal tubercles, longer than the body, but not reaching to tip of style, slightly hairy, articles I and II dark throughout, III, IV and V all transparently light or amber with dusky tips, VI amber with dusky band at nail-like process and at the tip. The lengths of the articles are as follows: I, 0.1 mm.; II, 0.08 mm.; III, 0.37 mm.; IV, 0.31 mm.; V, 0.31 mm.; VI, 0.52 mm. (spur 0.42 mm.); total 1.69 mm.; article III (Figure 196 G) has from six to eight large circular sensoria, IV (Figure 196 H) has one large circular sensorium three-fourths the distance from the base to the tip, V has a large circular sensorium near the tip, VI has the usual number of sensoria in the nail-like process. *Rostrum*—Reaching just beyond second coxæ, light yellow with dark base and tip. *Prothorax*—Twice as wide as long, shiny black, with distinct lateral tubercles. *Mesothorax*—Shiny black, muscle lobes prominent, making the mesothorax much higher than the other part of the body. *Metathorax*—Narrow transversely, black. *Abdomen*—Well rounded and smooth, shiny black or very dark brown with several small lateral tubercles on the margins. *Cornicles*—(Figure 196 C). Short, cylindrical, widest at base and narrowest at tip, with inconspicuously rimmed mouth, imbricated, black, length 0.2 mm., usually carried at right angles to the main axis of the body. *Legs*—Rather large, hairy; coxæ black, femora of fore-legs dark at tip only; femora of middle and hind legs amber with all but extreme bases black; tibiæ amber with bases and tips dark; tarsi dark. *Wings*—Rather large and hyaline. *Primary*—Length 3 mm., width 1.1 mm.; costal vein narrow and well defined, brown; subcostal wide and dark; stigma, the most characteristic feature of this insect, is very black and can be readily distinguished by the naked eye, long and narrow with the longest sides parallel, pointed at the tip, length 0.1 mm., width 0.15 mm.; stigmal arising near tip of stigma, well curved; first discoidal straight, light brown; second discoidal curved slightly inwardly, light brown; third discoidal once-branched, the branch arising near the middle of the vein (slightly nearer the tip from the middle), light brown. *Secondary*—Length 1.7 mm., width 0.5 mm.; subcostal extending to tip of the wing, curved upwardly between discoidals, downwardly just beyond base of the second discoidal, and thence upwardly to the tip; veins light brown. *Style*—Conical, hairy, black, length 0.1 mm., half as long as the cornicles.

APTEROUS VIVIPAROUS FEMALE (Figure 196 B)

Length not including the style 1.65 mm. or slightly longer, greatest width of the abdomen 1.25 mm. A dark robust form somewhat larger than the winged individuals.

Prevailing color—Velvety black, may or may not be shiny, some forms are slightly brownish-black. *Head*—Black, much wider than long. *Eyes*—Dark brown. *Antennae*—(Figure 196 F). On inconspicuous frontal tubercles, reaching to the bases of the cornicles, slightly hairy, articles I and II color of the body, III, IV and V light yellow with dusky tips, VI light with dark band at nail-like process and dusky tip, lengths of the articles; I, 0.1 mm, II, 0.07 mm.; III, 0.37

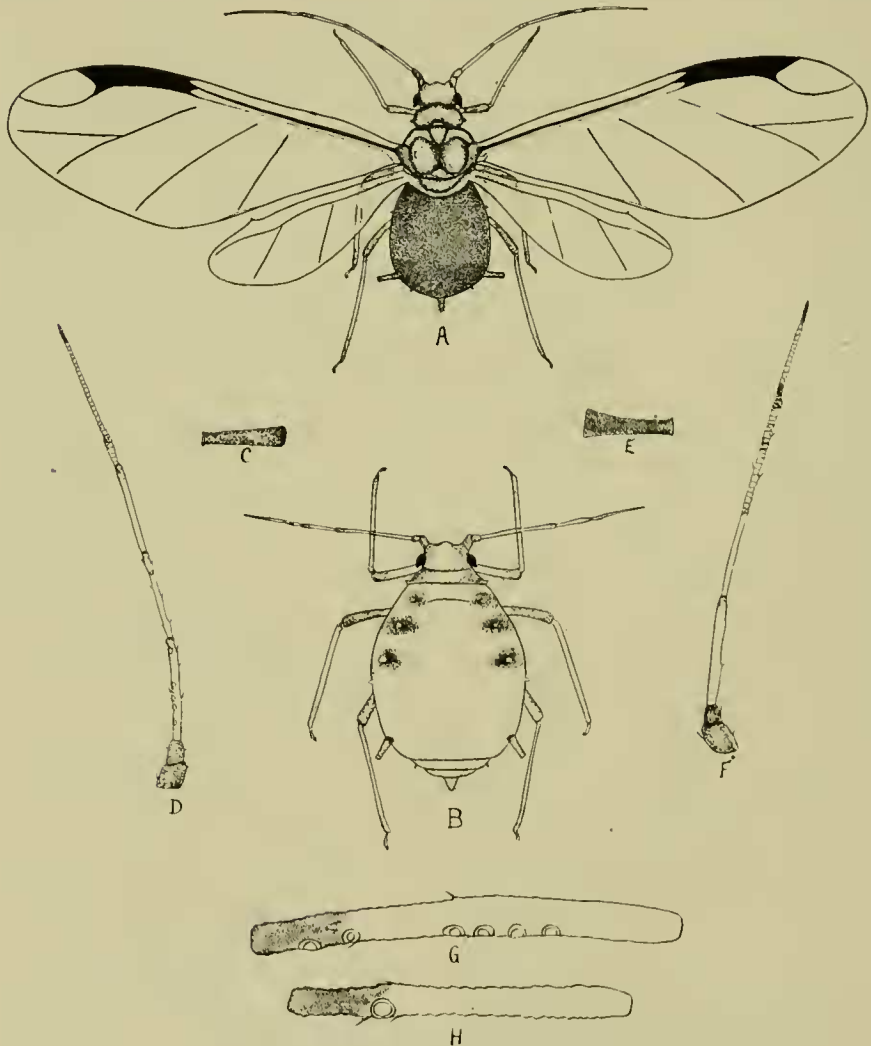


Figure 196. *Toxoptera aurantiae*

mm.; IV, 0.31 mm.; V, 0.31 mm.; VI, 0.45 mm. (spur 0.36 mm.); total 1.61 mm.; circular sensorium at apex of article V and usual ones in the nail-like process. *Prothorax*—With lateral tubercles at the base. *Meso- and Meta-thorax*—Not distinctly defined. *Abdomen*—Robust, smooth with lateral depressions near front margins, two marginal tubercles on each side, black or dark brown. *Cornicles*—(Figure 196 E). Cylindrical, widest at base and gradually tapering to tip which is slightly rimmed, imbricated, black, length 0.2 mm. *Legs*—Normal, hairy, colored as in the winged form. *Style*—Conical, much wider at base than at apex, hairy, black, half as long as cornicles, 0.1 mm.

Young—The young apterous forms are from dull brown to black, while the nymphs are reddish brown.

Hosts—This species settles in great colonies on the tender twigs of orange and lemon trees and may entirely destroy the new top on a young tree. They also feed upon the undersides of the leaves of suckers and tender shoots of old trees. In not a few cases old, tough leaves are attacked by this species. The presence of the insect upon the older leaves is usually recognized by the curling and twisting of the foliage so as to form a place of protection for them on the insides of the cup-shaped leaves. While this insect has been found feeding on Orange, Citron and Camellia in Europe and on *Pelea*, *Straussia* and *Coffea* in the Hawaiian Islands, I have been able to find it only upon citrus trees in this locality, where it seems to exist during the entire year.

Locality—Throughout the entire southern part of California. Taken by the writer in San Diego, Orange, San Bernardino, Los Angeles and Ventura counties. Wm. Davidson also reports it at San Jose.

Date of Collection—Occurs in this locality during the spring and early summer months in abundance. Collected April 3, 1911, when most numerous. Serial number 14.

This species is easily mistaken for another small black aphid working in a similar manner and nearly always associated with it on seedling trees, *Aphis gossypii* Glover. It is easily distinguished from *A. gossypii*, with the unaided eye, by the black stigma on the primary wings as referred to above, and most easily distinguished under the microscope by the third discoidal vein being but once branched instead of twice as in *A. gossypii*.

Natural enemies—This insect is most effectually held in check by the two internal parasites described hereinafter and by the larvæ of the large Syrphid Fly, *Lasiophthicus pyrastri* L., although the larvæ of the *Syrphus americanus* Wied., and of *Allograpta obliqua* Say. play an important part in this. Of the ladybird beetles, *Coccinella californica* Mann. is the most important enemy here.

Mr. John June Davis, Mr. J. T. Monell, Prof. Theo. Pergande and Prof. Wm. Davidson have aided me much in the determination of this species.